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Link to article, DOI:
10.1109/PIERS.2016.7735778

Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

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Abstract— The bandwidth of wireless networks needs to grow exponentially over the next decade, due to an increasingly interconnected and smart environment, driven by cloud applications operating on mobile devices. Low-cost, compact and broadband wireless transceivers operating over different frequency bands will be required. The current WiFi (low)frequency bands do not have enough capacity and wireless communication needs to move to the millimeter-wavelength or sub-terahertz range. Furthermore, millimeter-wavelength links offer a flexibility solution for non-incumbent operators to lay down fiber-like capacity links when deploying fiber is not an option. Radio-over-Fiber (RoF) technologies have evolved from a blue sky academic topic in the 90s to a main driver within the current quest for the 5th generation mobile systems (5G). A twist in RoF technologies is that it has found along the way niches in areas non purely related to communication technologies (ICT) applications: distribution of highly pure clock signals for radio telescopes, photonic-based coherent radar and fiber optic sensing. It is however in the communication arena where RoF seems to be able to provide a technological edge; RoF techniques based on photonic technologies enable to generate, transport and radiate in a straight forward manner microwave and millimeter wave signals. Although electronic technologies are able to sustain an increase in frequency from a technology point of view, with current developments hitting the Terahertz regime, the complexity of fabrication and to integrate this solutions have to compete with the off-the-shelf solutions provided by RoF technologies. Technologically though, reconfigurable Radio-over-Fiber networks require a co-design effort involving tunable lasers, digital signal processing, high speed modulators and photodiodes and optical switching technologies. Furthermore, reconfigurability is key as future networks are expected to be malleable. An overview on the state-of-the-art and current efforts towards optical components enabling photonic reconfigurability and experiments demonstrating such feature will be given during the presentation.

ACKNOWLEDGMENT

This research is funded through Marie Curie FENDOI and FIWIN5G projects and IPHOBAC-NG through the European Commission and the mmW-SPRAWL through the Danish Research Council.

REFERENCES

1. Vegas Olmos, J. J. and Tafur Monroy, I. "Reconfigurable Radio-over-Fiber Networks," *IEEE/OSA JOCN*, Vol. 7, No. 11, B23-B28, 2015.
2. Vegas Olmos, J. J., Pang, X. and Tafur Monroy, I. "E- and W-band high-capacity hybrid fiber-wireless link," *IEICE Trans. in Comm.*, Vol. E97-B, No. 7, 2014.
3. Vegas Olmos, J. J., Kuri, T., Sono, T., Tamura, K., Toda, H. and Kitayama, K-I., "Wireless and optical-integrated access network with peer-to-peer connection capability," *IEEE PTL*, Vol. 13, No. 20, 1127–1129, 2008.